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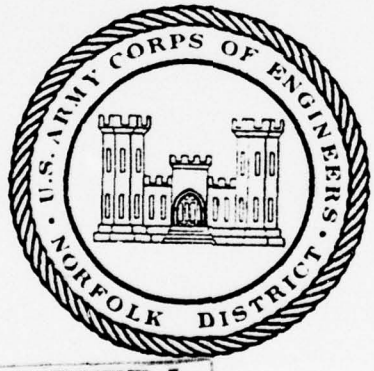
SEPTEMBER, 1979

Name Of Dam: MOSS NO. 1 DAM
Location: DICKENSON COUNTY, VIRGINIA
Inventory Number: VA. NO. 05102

LEVEL II

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



PREPARED FOR

NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

BY

SCHNABEL ENGINEERING ASSOCIATES, P.C./
J. K. TIMMONS AND ASSOCIATES, INC.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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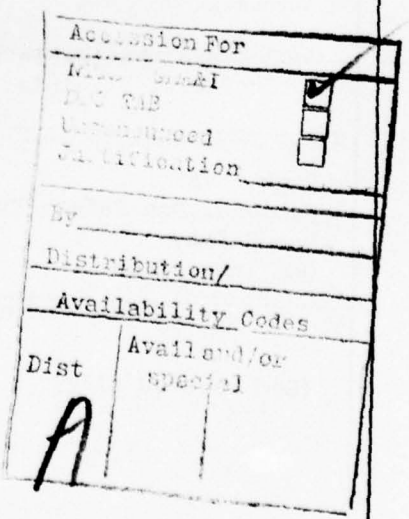
20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam and appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.



NAME OF DAM: MOSS NO. 1 DAM
LOCATION: DICKENSON COUNTY, VIRGINIA
INVENTORY NUMBER: VA. NO. 05102

(6) National Dam Safety Program. Moss Number 1 Dam (Inventory Number VA Ø51Ø2), Dickenson County, Virginia. Phase I Inspection Report.

(9) Final rept., (11) Sep 79

(12) 47

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

(15) DACW65-79-D-ØØØ4

(10) James A. Walsh

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5B

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

TABLE OF CONTENTS

Name of Dam: Moss No. 1 Dam
State: Virginia
County: Dickenson
USGS Quad Sheet: Pound
Coordinates: Lat 37°-07' Long 82°-31.9'
Stream: Lick Fork
Date of Inspection: June 12, 1979

BRIEF ASSESSMENT OF DAM

Moss No. 1 Dam is a mine waste cross valley structure which was constructed with coarse to fine coal refuse and slurry materials. It is about 800 ft long and 154 ft high. There is no spillway and all runoff is impounded. Impounded water is removed by seepage, evaporation and pumping if necessary. The dam is located on Lick Fork about 4.0 miles east of Pound, Virginia. The dam was constructed for coal refuse disposal beginning in about 1955 and is owned and maintained by the Clinchfield Coal Company, Dante, Virginia.

This dam is an intermediate size, "significant" hazard structure and the spillway design flood (SDF) is the ½ Probable Maximum Flood (½ PMF).

The impoundment will store 100 percent of the PMF with 14 ft of freeboard. Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the impoundment is adequate.

The actual embankment structure appears to be similar to the design drawings for the abandonment of the dam. The stability analysis for the original dam prior to the modifications presently in progress indicates a factor of

safety of 1.46 with respect to steady seepage. This is slightly less than the 1.5 requirement included in Reference 1, Appendix VI. The present modifications will improve the stability of the structure and additional studies are not recommended.

The visual inspection revealed no apparent problems with the embankment and there are no immediate needs for remedial measures. Areas exhibiting severe erosion in the left abutment area of the downstream face should be back-filled and compacted.

Prepared by:

SCHNABEL ENGINEERING ASSOCIATES, P.C./
J. K. TIMMONS AND ASSOCIATES, INC.

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Submitted By:

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for Douglas L. Haller
Colonel, Corps of Engineers
District Engineer

Recommended By:

Original signed by:
Carl S. Anderson, Jr.

for Jack G. Starr, R.A., P.E.
Chief, Engineering Division

Date: SEP 27 1979

OVERVIEW PHOTO

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
MOSS NO. 1 DAM NO. 05102

SECTION 1 - PROJECT INFORMATION

1.1 General:

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (See Reference 1, Appendix VI). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Project Description:

1.2.1 Dam and Appurtenances: Moss No. 1 Dam is a mine waste structure, constructed with coarse to fine coal refuse and slurry materials. It is approximately 800 ft long and 154 ft high.* The top of the dam is 30 to 220 ft wide and is at elevation 2061$^{\pm}$ msl. The downstream slope is 5 horizontal to 1 vertical (5:1) except at the toe where it steepens from 2:1 to 1:1 (See Plate 3, Appendix I). The upstream slopes are about 1:1.

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* This height of dam above natural ground at centerline.

There is no outlet for runoff impounded by the structure. All runoff and refuse waste slurry is impounded. Water is lost from the impoundment through slurry evaporation and seepage. This dam is used as an impoundment to contain coal process refuse in a slurry form. The sediment buildup is approximately 21 ft below the dam crest (Elev 2040± MSL).

Modifications are presently in progress which will provide for future coal refuse disposal and eventual abandonment of the impoundment.

1.2.2 Location: Moss No. 1 Dam is located on Lick Fork, 4.0 miles east of Pound, Virginia, (See Plate 1, Appendix I).

1.2.3 Size Classification: The dam is classified as an "intermediate" size structure because the maximum potential storage capacity is 1314 acre ft.

1.2.4 Hazard Classification: The dam is located in a rural and heavily forested area; however, based upon the downstream proximity of the coal process facilities (3000'±), the dam is assigned a "significant" hazard classification. The hazard classification used to categorize a dam is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: The Clinchfield Coal Company, a member of the Pittston Coal Group, owns and maintains the dam.

1.2.6 Purpose: This impoundment is used as a coal process refuse disposal facility.

1.2.7 Design and Construction History: There were no original design data available; however, the dam was reportedly constructed under the supervision of the Clinchfield Coal Company. Future use and abandonment plans are currently being prepared by the Owner's engineering consultant and modifications are presently in progress. An abandonment plan is the filling of the impoundment with refuse, and diversion of runoff away from the impoundment. Initial engineering studies were performed by L. Robert Kimball and Associates in 1978; however, Orbital Engineering has since been retained by the Owner for completing the plan. Reports and plans are submitted on an interim basis and the study was not complete at the time of the inspection.

1.2.8 Normal Operation Procedures: There is no spillway or outlet for this impoundment. Coal waste wash water is pumped into the impoundment 24 hours a day. Particles in the wash water settle out and the bottom of the pond is constantly changing. The water is normally less than 2 ft deep and escapes the impoundment by downward seepage. During periods of extreme floods, all water is impounded and then pumped out if the seepage rate is insufficient to lower the water level. The purpose of the structure is not to impound water, but to impound fine refuse.

1.3 Pertinent Data:

1.3.1 Drainage Areas: The drainage area is 0.29 square miles.

1.3.2 Discharge at Dam Site: Maximum known flood at the dam site occurred in April 1977; however, the pool elevation was not observed.

1.3.3 Dam and Reservoir Data: See Table 1.1 below.

Item	Reservoir				
	Elevation Feet msl	Area Acres	Acre Feet	Watershed Inches	Length Miles
Crest of Dam	2061	39	1314	75	.35
Top of Sediment* (Normal Pool)	2040±	27	0	0	.3
Streambed at Downstream Toe of Dam	1900±	-	-	-	-

* Normal pool or top of sediment is in a state of flux and continuously increasing in elevation.

SECTION 2 - ENGINEERING DATA

2.1 Design: Original design drawings and calculations were not available. Future use and proposed modification plans are presently being developed. Data available at the time of the inspection was prepared in 1978 by L. Robert Kimball and Associates (Reference 6, Appendix VI). These plans show the existing topography and proposed grading of the structure. To increase the life of this structure, it was proposed to raise the crest of the embankment approximately 40 ft. The dam is a heterogeneous compacted mine waste embankment. Site plans are presented on Plates 2 and 3 of Appendix I.

All phases of mining operations are controlled and regulated by the U.S. Department of Labor, Mine Safety and Health Administration (MSHA); the Virginia Division of Mines and Quarries (VDMQ); and the Virginia Division of Mined Land Reclamation (DMLR). The dam is currently used and maintained in compliance with standards required by the above governmental agencies.

Subsurface investigation and laboratory data originally developed by Kimball included four test borings drilled in 1977 at the locations shown on Plate 3, Appendix I. Test boring logs are provided on Plates 4 and 5 of Appendix IV and a section through the embankment is provided on Plate 6, Appendix V. The test boring data indicates the embankment has been constructed with coarse to fine coal refuse and slurry materials ranging from 80 to 200 ft± in thickness.

Underlying overburden soils ranged from 10 to 60 ft± in thickness and rest upon an irregular bedrock surface consisting of sandstone, shale and some coal.

Laboratory tests were made on six undistrubed tube samples. One sample obtained for the overburden in B-1 was described as fill and classified as SC material (Unified Soil Classification System). Two samples of the coarse coal refuse were classified as GW-GM and SM. Three samples of the fine coal refuse were classified as SW-SM.

In order to evaluate the stability of the embankment, triaxial shear tests were performed on undisturbed samples of coarse and fine coal refuse and one overburden (fill) sample in order to identify strength parameters of the in situ soils. The Simplied Bishop Method of stability analysis was used. Kimball concluded that the static factor of safety for the steady seepage condition was 1.46 for the existing dam configuration. A summary of the stability analysis is presented as Appendix V.

2.2 Construction: Construction records were not available.

2.3 Operation: Modifications are presently in progress which will provide for future coal refuse disposal and eventual abandonment of the impoundment. The impoundment crest as planned will be raised in levels with each level allowing the storage of two PMFs. Water observation wells were installed in 1977 in order to monitor the phreatic water level below the downstream slope. Water levels are monitored weekly by the Clinchfield Coal Company. Readings taken during the

inspection are recorded in Section 7.2, of Appendix III.

SECTION 3 - VISUAL INSPECTION

3.1 Findings: The dam was generally in good condition at the time of inspection. Field observations are outlined in Appendix III and described in the following paragraphs.

3.1.1 General: An inspection was made 12 June 1979, and the weather was fair with a temperature of 65°F. The pool elevation was normal at the time of inspection with 20 ft± of freeboard. The pool elevation was 2040 ft± msl and no tailwater was observed. This corresponds to the normal conditions for this impoundment. The ground conditions were dry at the time of inspection.

3.1.2 Dam: There was no spillway and the pool elevation was approximately 20 ft below the top of the dam which is a normal condition. The dam has been constructed with coarse coal refuse and is devoid of vegetation. The downstream slope is 5:1, but approaches 1:1 at the toe approximately 450 ft below the crest of the dam. The upstream slope is 1:1. Scattered gullies, approximately 1 ft wide and several ft deep were observed along the downstream slope. Additional erosion was noted in two drainage ditches present across the downstream slope. The erosion was most pronounced near the left abutment, particularly in the upper ditch (30 to 50 ft below the lowest observation well), where a 5 ft± gully existed, about 100 ft± from the left abutment.

The owner indicated that seepage from the impoundment flows northward in the subsurface, passes through the mountain and eventually surfaces in the valley beyond the impoundment.

Wet spots were observed at three locations (Plate 3, Appendix I) on the downstream slope. The wet spots are reportedly the result of surface water percolating into the embankment above and seeping out horizontally along old haul road surfaces, which are now covered with coarse coal refuse.

Water observation well readings varied from 105 to 176 ft below the top of the dam (See 7.2, Appendix III). The data indicates the water level is located in the slurry below the coarse coal refuse and in the weathered and fractured bedrock.

Bedrock is exposed along both abutments, but particularly along the basal portion of the left abutment. Bedrock consists of alternating beds of flat-lying sandstone, shale and coal. The embankment appears to have been constructed by pushing the refuse material against the abutments, but does not appear to be keyed in.

3.1.3 Reservoir Area: The reservoir has steep side slopes ranging from about 1:1 to vertical. These slopes are the remains of past strip mining and deep mining operations. No debris was observed at the time of inspection. Sediment was observed to be within 20 ft of the top of the dam

3.1.4 Downstream Area: The downstream area includes the Moss Mine No. 1 Fresh Water Impoundment immediately below this impoundment and the Moss No. 1 coal processing facility approximately 3000 ft downstream.

3.2 Evaluation:

3.2.1 Dam: Overall, the embankment was in satisfactory condition at the time of the inspection. Areas exhibiting surface erosion on the downstream slope should be backfilled

and regraded, particularly the more severely eroded ditches near the left abutment. Wet spots are not believed to be caused by seepage from the impoundment and monitoring is not required.

3.2.2 Reservoir Area: No conditions were encountered which would require special attention.

3.2.3 Downstream Area: The coal processing facility downstream is potentially subject to severe damage and possible loss of life in the event of a dam failure.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures: Moss No. 1 Dam is a refuse disposal area. The reservoir area is used to collect slurry from present coal washing operations conducted at Moss No. 1 Dam. The slurry is pumped into the reservoir area, and the solids settle out while the water seeps through the embankment and surrounding mountains. The Clinchfield Coal Company has a plan outlined to fill this reservoir with coal refuse and then reclaim it at some future date.

L. Robert Kimball and Associates prepared a study and a plan for the future use and abandonment of this impoundment in 1978. At present the 5-year plan is being implemented under the direction of Orbital Engineering.

4.2 Maintenance of Dam and Appurtenances: Maintenance is the responsibility of the Clinchfield Coal Company, a member of the Pittston Coal Group. There are no operating appurtenances at this site.

4.3 Warning System: None exists.

4.4 Evaluation: Operational procedures for the refuse disposal facility appear adequate and in accordance with prepared plans.

SECTION 5 - HYDRAULICS/HYDROLOGIC DATA

5.1 Design: No data was available.

5.2 Hydrologic Records: There are no hydrologic records available for this drainage area.

5.3 Flood Experience: The maximum pool elevation observed was in April 1977; however, maximum pool elevation was not known. All rainfall was contained within the impoundment.

5.4 Flood Potential: In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof.

Precipitation amounts for the U.S. Weather Bureau Information (Reference 4, Appendix VI). Appropriate adjustments for basin size and shape were accounted and inflow volumes were determined by procedures outlined in Reference 4, Appendix VI. The maximum pool elevation was determined from the reservoir storage curve at the volume of inflow predicted.

5.5 Reservoir Regulation: The pool elevation within the impoundment was assumed at elevation 2040 msl prior to rainfall inflow.

5.6 Overtopping Potential: The predicted rise of the reservoir pool and other pertinent data were determined by storing the volume of inflow in the reservoir without any discharge. The results for the flood conditions (PMF, ½ PMF) are shown in the following Table 5.1.

TABLE 5.1 RESERVOIR PERFORMANCE

	VOLUMES		
	Normal Flow	½ PMF	PMF
Total Inflow, Ac-Ft	0	200	400
Maximum Pool Elev. Ft., msl	-	2047	2054

5.7 Reservoir Emptying Potential: The reservoir cannot be emptied except through seepage or pumping. Seepage and pumping will lower the reservoir sufficiently to accomodate additional rainfall without overtopping.

5.8 Evaluation: Department of the Army, COE, guidelines indicate the appropriate design Flood (SDF) for an intermediate size, significant hazard dam is the ½ PMF to PMF. Due to the risk involved, the ½ PMF has been selected as the SDF. The reservoir will store 100 percent of the PMF without any discharge and the reservoir is considered adequate.

SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: The dam site is located within the southeast portion of the Appalachian Plateau (locally Cumberland Plateau) Physiographic Province of Virginia. The Cumberland Plateau is a stream dissected plateau which is underlain by sedimentary rocks up to Upper Pennsylvanian in age (see Reference 3, Appendix VI). Throughout Dickenson County the ground surface is extremely rugged.

The dam site is underlain by rocks of the Wise Formation of Middle to Upper Pennsylvanian Age. This formation consists of alternating beds of sandstone, shale and coal; however, many beds of clay also occur within the formation. Only the lower 750 ft of the formation is exposed in northwest Dickenson County and economic coal beds are generally restricted to the lower 200 ft. Bedrock is generally flat-lying throughout the area.

Bedrock was exposed in the abutments, particularly along the left abutment. The bedrock is essentially flat-lying and consists of alternating beds of sandstone and shale with occasional thin interbeds of coal. Test boring logs indicate the dam is underlain by 9 to 62 ft$\pm$ of overburden soils which were generally described as sandy silty clays with varying amounts of cobbles and boulders. Zones of cobbles and boulders may represent alluvial and colluvial deposits present in the old stream channel. Although the boring logs do not indicate the presence of fill beneath the

refuse and slurry materials, laboratory test data describes a sample taken in the top of the overburden in Boring B-1 as fill. Core recoveries from the underlying bedrock ranged from 70 to 93 percent and RQD* values of 50 to 58 percent were calculated on the NX (2-1/8" diameter) cores. Boring logs and core recoveries indicate that the upper portion of bedrock is variably weathered and fractured. No faults were observed in the field during this investigation and geologic maps of the area do not show the presence of any faults in the immediate vicinity.

6.2 Embankment: The downstream face slopes at 5 horizontal to 1 vertical (5:1) before steepening to 1:1 at the toe (See Plate 3, Appendix I). The top of the dam is at elevation 2061± msl and ranges from 30 to 220 ft in width. The upstream slope is 1:1 to vertical due to construction activities. Several diversion ditches were present below the four water observation wells present in the downstream slope. These wells are used to monitor the phreatic water level in the embankment. Readings taken during the inspection indicate the water level is located in the slurry below the coarse coal refuse and in the weathered and fractured bedrock.

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* Rock Quality Designation (RQD) is defined as the total length of rock core fragments recovered during drilling, which are greater than 4 inches in length, discounting drilling breaks and mudseams, expressed as a percentage of the total length cored.

6.3 Evaluation:

6.3.1 Foundation and Abutments: Dam foundations must be evaluated on the basis of potential settlement, sliding and seepage. Excessive settlement of the dam is not believed to be a problem since test boring data indicates the structure rests upon fairly competent bedrock and firm to compact overburden soils.

Sliding within the foundation bedrock would not normally appear to be a problem based upon the nature of the Wise Formation. A review of the geologic data indicates that there are probably no adversely oriented weak planes within the foundation rock that would act as a potential sliding plane. Based upon the reported satisfactory performance of the dam for more than 20 years, sliding within the foundation would not appear to be a problem.

The report provided by Kimball stated that portions of the immediate area had been deep-mined for coal, generally between elevations 1750 msl and 1900 msl. The deepest test boring (B-1) extended to approximately elevation 1840 msl and no voids or openings were reported. Based upon the present pool level, subsurface collapse would not appear to present an extreme hazard downstream.

Water level readings and review of the boring logs indicates that seepage occurs beneath the embankment through the underlying fractured bedrock. Representatives of the Owner indicated that seepage from beneath the impoundment is known to flow in the subsurface in a northward direction and exists along mountainous slopes to the north. The wet

spots encountered along the downstream slope are not believed to be related to seepage through the dam.

The abutment slopes were considered stable at the time of inspection. Bedrock exposed is essentially flat-lying and only minor sloughing was generally observed along the lower portions of the slopes.

6.3.2 Embankment: No undue settlement, cracking or seepage was noted at the time of inspection; thus it appears that the embankment is adequate for normal pool level with water at elevation 2040$^{\pm}$ msl. The stability analysis performed for the original embankment indicated the factor of safety of 1.46 for the steady seepage case to be slightly less than the factor of safety of 1.5 required by the guidelines included in Reference 1, Appendix VI. The rapid drawdown case was not considered since it is not possible for this type of loading condition to occur. Since the dam is presently being modified and stability analyses will be performed for this modification, no additional studies are recommended. The continual placement of coarse coal refuse along the downstream slope will also provide for a more stable structure.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: Moss No. 1 Dam at the time of inspection was in good condition. The dam is an "intermediate" size, "significant" hazard structure. The appropriate design flood is the ½ PMF. The impoundment will contain the ½ PMF without overtopping the dam and is considered adequate.

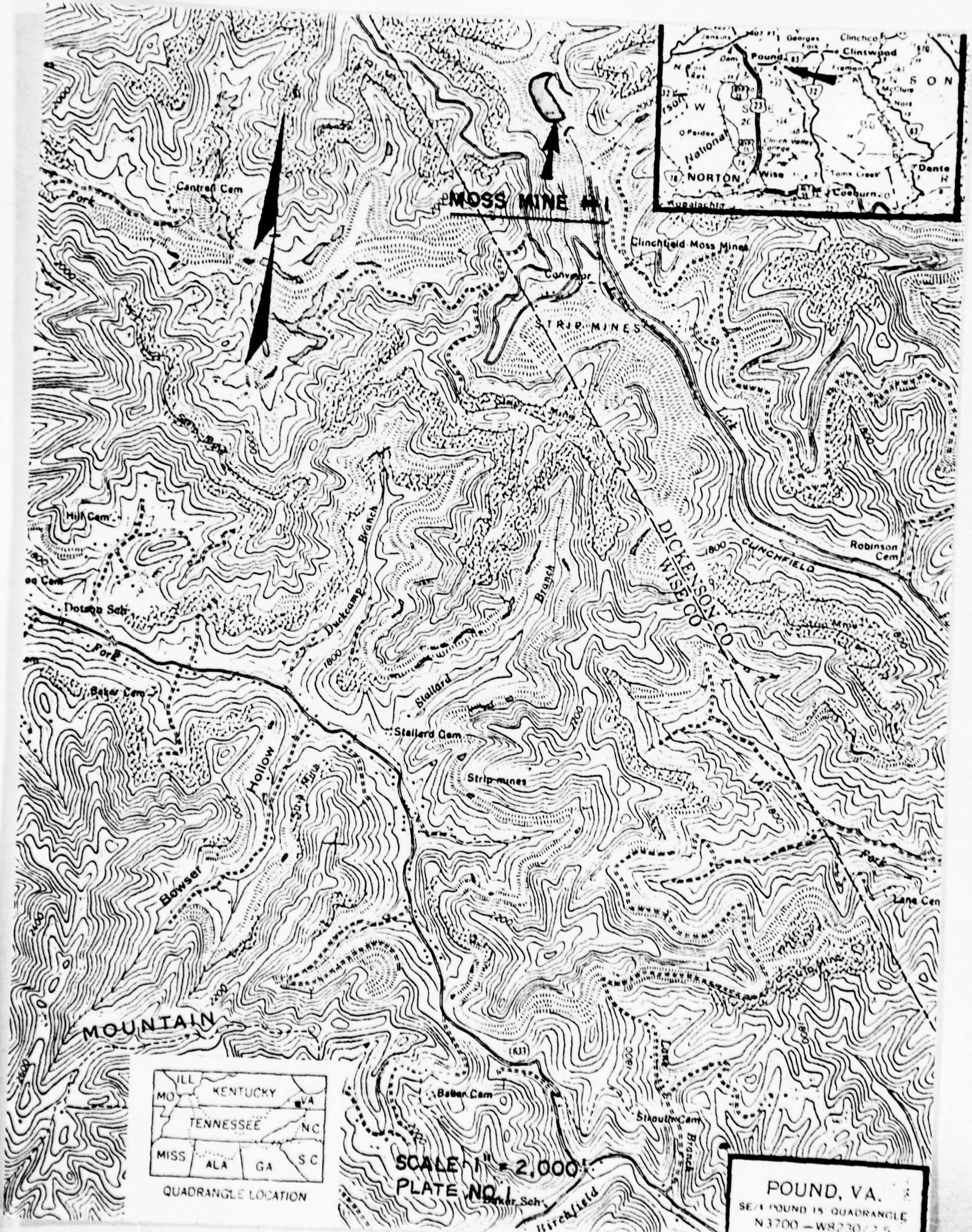
The actual embankment structure appears to be similar to the abandonment drawings. The stability analysis performed for the steady seepage case for the embankment prior to modification indicates the factor of safety of 1.46 for the steady seepage case is slightly less than the 1.5 required by Reference 1, Appendix VI. Modifications presently in progress will increase the factor of safety of the embankment and no further studies are recommended.

7.2 Remedial Measures: Based on the visual inspection and review of existing records, there is no serious problem that would require immediate action for the normal pool conditions. The following maintenance procedure should be initiated within 6 months:

7.2.1 Severely eroded areas present in the drainage ditches near the left abutment of the downstream slope should be backfilled and compacted.

APPENDIX I

MAPS AND DRAWINGS


MOSS MINE #1
Clinchfield Moss Mines
Conveyor
STRIP MINES
Cantrell Cem
Fork
Hill Cem
Dotson Sch
Baker Cem
Duckcamp Branch
Branch
Stallard
Stallard Cem
Strip mines
DICKENSON CO
WISE CO
CLINCHFIELD
Robinson Cem
Lane Cem
Hollow
Bowser
MOUNTAIN
Baker Cem
Stout Cem
Branch
Birchfield
Baker Sch
Pound
Clintwood
Clinchco
NORTON
Wise
Coeburn
Dante
National
ILL
KENTUCKY
MO
VA
TENNESSEE
NC
MISS
ALA
GA
SC
QUADRANGLE LOCATION
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POUND, VA.
SE/4 POUND 15' QUADRANGLE
N3700 — W8230/7.5

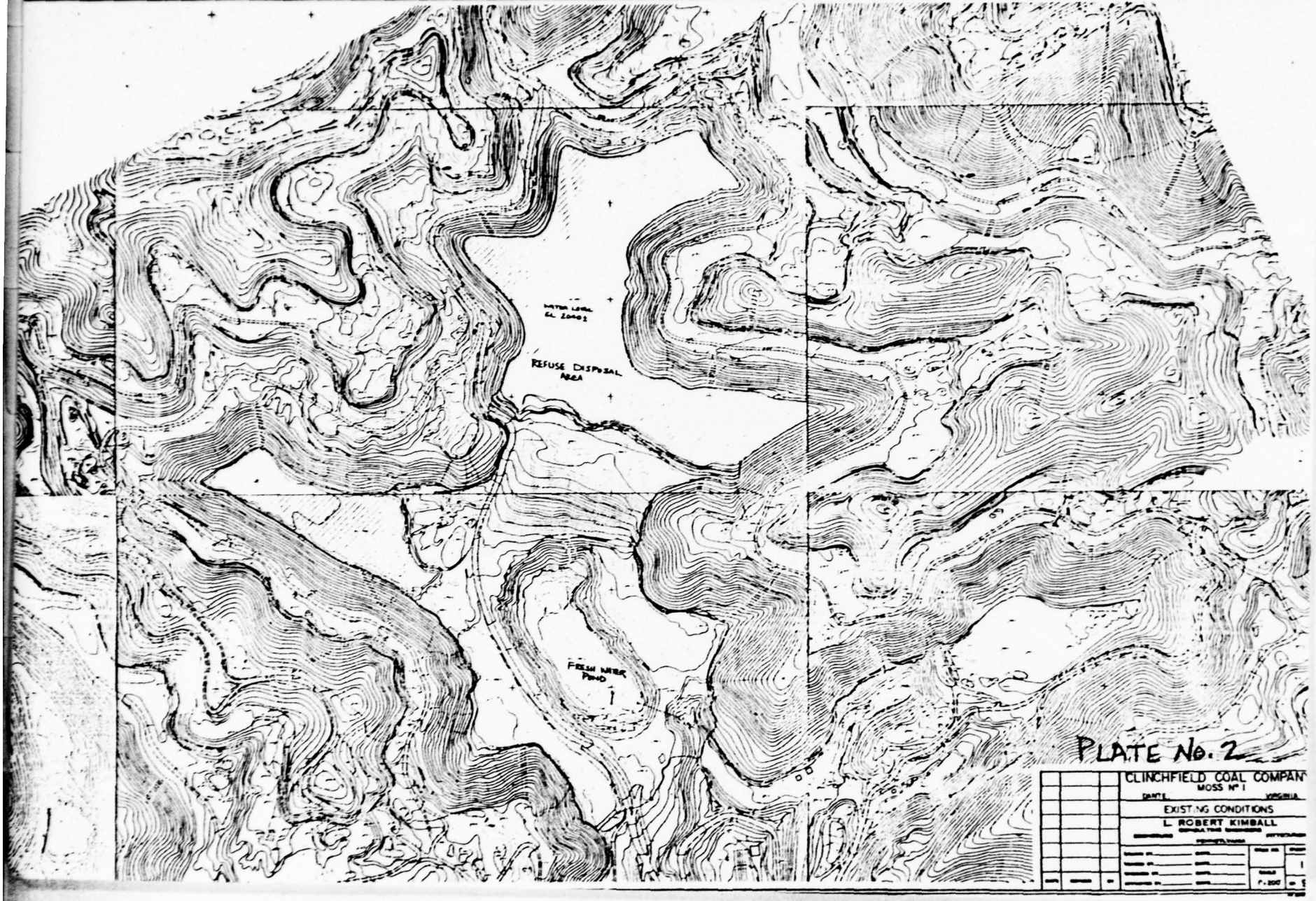
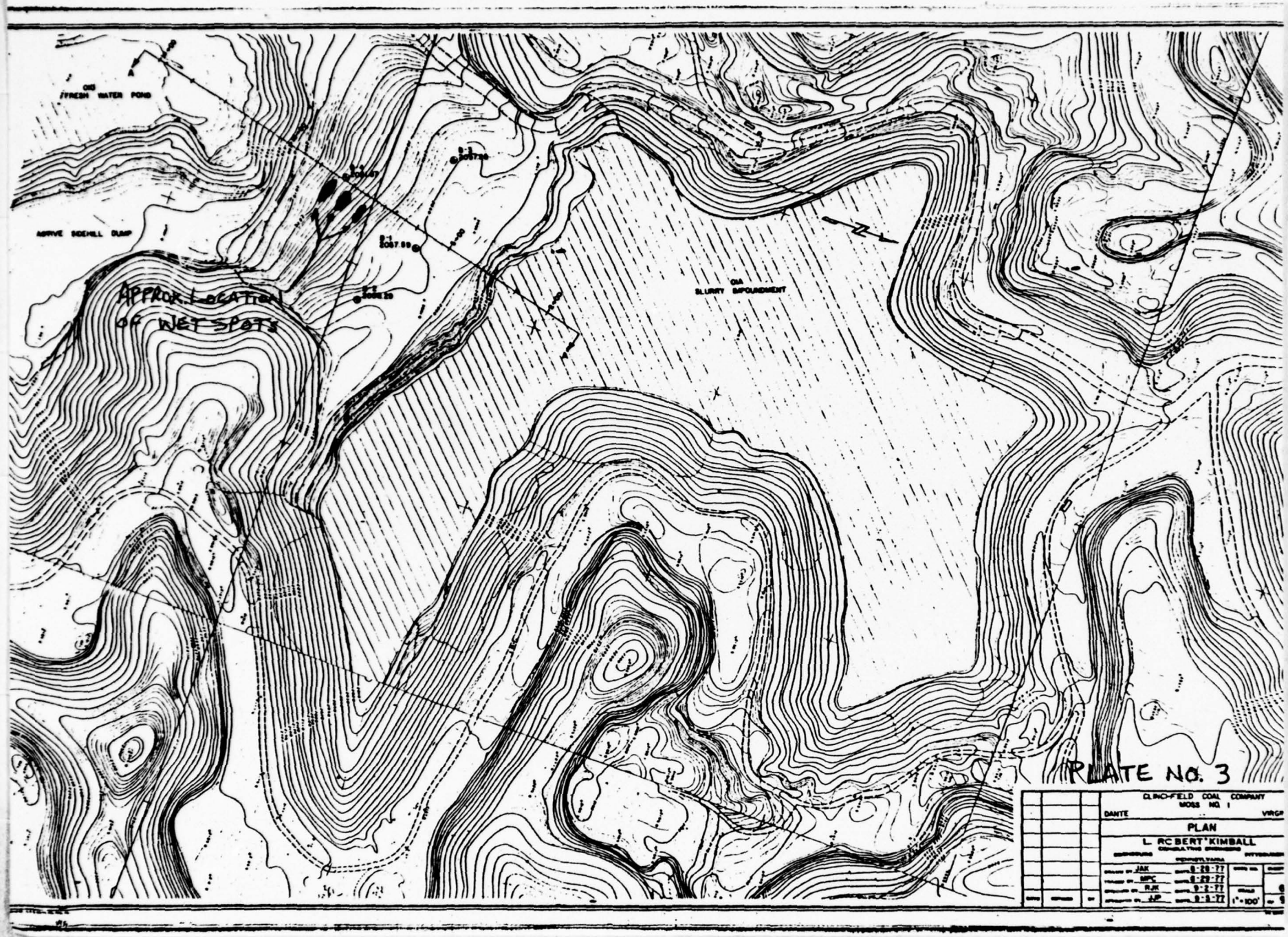


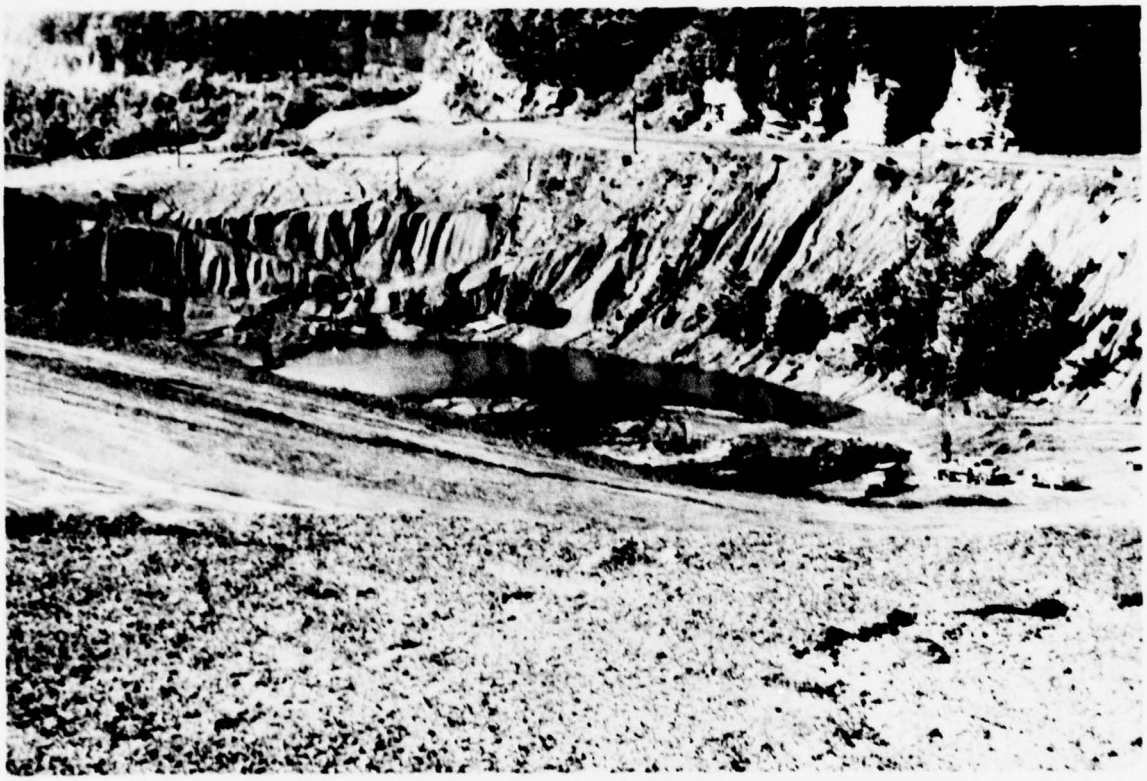
PLATE No. 2

CLINCHFIELD COAL COMPANY
MOSS No 1
EXISTING CONDITIONS
L. ROBERT KIMBALL

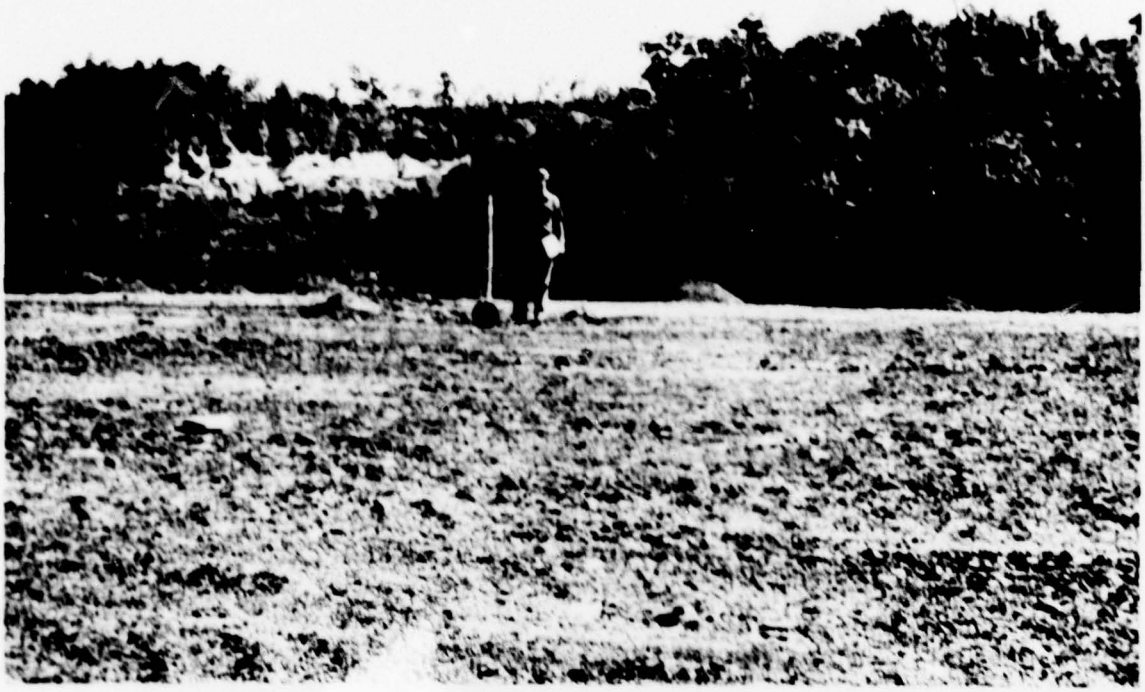

FRESH WATER POND
ABRVE SIDEHILL DUMP
APPROX. LOCATION OF WET SPOTS
SLURRY IMPOUNDMENT
PLATE No. 3
CLINCHFIELD COAL COMPANY
MOSS NO. 1
DANTE
PLAN
L. ROBERT KIMBALL
JAK
MPC
RJK
JP
1"=100'

APPENDIX II

PHOTOGRAPHS



VIEW FROM TOP OF IMPOUNDMENT LOOKING TOWARD FRESH WATER POND AT BASE OF MOSS MINE NO. 1 IMPOUNDMENT.



VIEW ACROSS TOP OF IMPOUNDMENT SHOWING OBSERVATION WELL

UPSTREAM FACE OF EMBANKMENT AND SEDIMENT SURFACE

STAFF GAGE AND SIDE SLOPES OF RESERVOIR

APPENDIX III

FIELD OBSERVATIONS

FIELD OBSERVATIONS

Name of Dam: Moss No. 1

County: Dickenson

State: Virginia

Coordinates: Lat 37° 07' Long 82° 31.9'

Date of Inspection: June 12, 1979

Weather: Fair, temperature 65°F

Pool Elevation at Time of Inspection: 2040± msl

Tailwater at Time of Inspection: No tailwater observed

Inspection Personnel:

Schnabel Engineering Associates, P.C.
Ray E. Martin, P.E.
Stephen G. Werner (recorder)

J. K. Timmons and Associates, Inc.
Robert G. Roop, P.E.
William A. Johns (recorder)

Clinchfield Coal Company
Michael Holbrook

Orbital Engineering
J. E. Barrick, P.C.

State Water Control Board
Hugh Gildea, P.E.

Mine Safety and Health Administration
Phil Muron, Jr.
Doug Carico

Virginia Division of Mines and Quarries
Lewis Wheatley
Arthur Reed

1 Embankment:

1.1 Surface Cracks: The slopes, crest, and abutment contacts were inspected and no

cracks were noted. The dam surface consists of coarse coal refuse and is essentially free of vegetation.

1.2 Unusual Movement: No unusual movements were noted on the dam or downstream beyond the embankment toe.

1.3 Sloughing or Erosion: Two diversion ditches slope downward and to the left across the downstream slope. The ditches begin in an area 100 ft$^{\pm}$ downslope from the lowest or front water observation well. Severe erosion (5 ft$^{\pm}$ deep) was noted in the upper ditch, approximately 100 ft from the left downstream abutment about 30 to 50 ft in front of the lowest water observation well. Scattered washes 1 ft$^{\pm}$ wide and several ft deep were observed on the embankment and in these ditches. The downstream slope is 5:1 before approaching 1:1 at the toe. The upstream slope is 1:1 to vertical.

1.4 Alignment: The vertical and horizontal alignment of the dam was visually observed to be in accordance with construction drawings for the future use plans for the dam.

1.5 Riprap: None.

1.6 Junctions: The coarse coal refuse appears to have been pushed against the abutment slopes, but does not appear to be tied in. The abutment slopes include scattered exposures of flat-lying sandstone, shale, and coal.

1.7 Seepage: Seepage from the impoundment reportedly flows northward through the underlying bedrock and exists along mountain slopes. Three wet spots were noted along the downstream slope. We understand that surface runoff follows three old haul roads, which have been filled over

and these wet spots are related to subsurface flow along these roads. The wet spots range from 50 to 100 ft$^{\pm}$ in length and are 10 ft$^{\pm}$ to 20 ft$^{\pm}$ wide. They are directly below each other and their long axes paralled the crest of the dam. The first is 185 ft$^{\pm}$ below B-1 (See Plate 3, Appendix I), the second is 50 ft$^{\pm}$ below the first we spot, and the third wet spot is 40 ft$^{\pm}$ below the second wet spot.

2 Outlet Works: None.

3 Ungated Spillway: None.

4 Gated Spillway: None.

5 Reservoir:

5.1 Slopes: Steep fill slopes (1:1 and steeper) bound the impoundment. The right and rear slopes are moderately vegetated, while the left slopes are located against heavily wooded natural slopes.

5.2 Sedimentation: Reservoir is filled with sediment to within 20 ft$^{\pm}$ of the dam crest.

6 Downstream Channel:

6.1 Condition: No channel exists; spoil piles and Moss No. 1 Fresh Water Pond are located at the toe of the impoundment.

6.1 Slopes: Steep natural slopes with sandstone and shale bedrock occur on the left side. Fill slopes and a haul road exist on the right side.

6.3 Population and Facilities: Moss No. 1 coal processing facility is located 3000 ft$^{\pm}$ downstream.

7 Instrumentation:

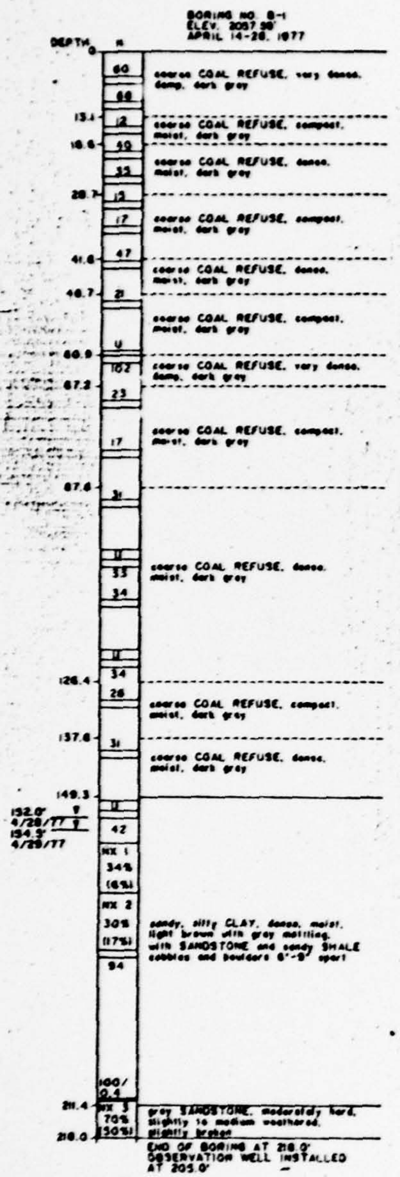
7.1 Monumentation: None

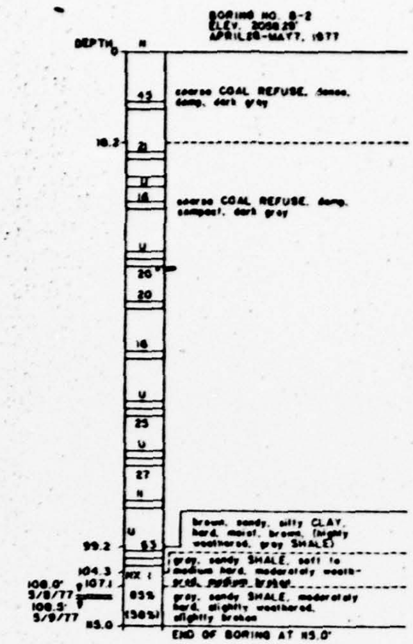
7.2 Observation Wells and Piezometers: Four observation wells or piezometers were noted in the field (See Sheet 3, Appendix I). The following water levels were measured:

Boring No.	Elevation	Water Level (ft±) Below Ground Surface
B-1	2057.6	156.5
B-2	2058.3	105.3
B-3	2057.3	176
B-4	2021.9	95.5

APPENDIX IV

TEST BORING LOGS





● LEGEND

"N" Denotes blows per foot 12" of standard penetration or method of sampling
"U" Denotes undisturbed sample (Shelby)
"NX" Denotes an NX size double tube core barrel using a diamond bit and water
(%) Denotes rock quality designation RQD
% Indicates percentage of sample recovered

Size of split spoon ———— 2 inches
Weight of hammer ———— 140 pounds
Drop of hammer ———— 30 inches
Ground water elevation ——— ▽

● NOTES:

Drilling Company: L. Robert Kimball
Drill Rig: CME 550
Driller: Gene Kaluzinski
Inspector: Robert A. Dearderff, geologist
Test borings advanced w/4" HW casing.

DRAFTED BY: L. ROBERT KIMBALL
AUTOMATED DESIGN DEPARTMENT

PLATE No. 4

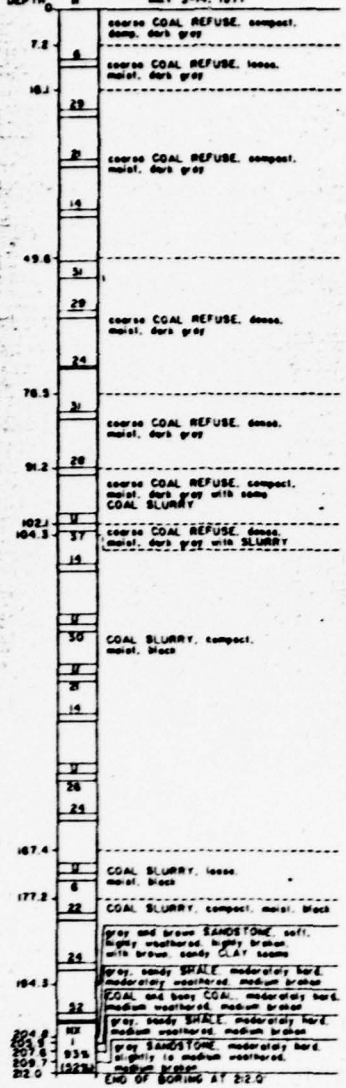
SEE PLAN SHEET 6 FOR LOCATION OF TEST BORINGS

CLINCHFIELD COAL COMPANY
MOSS NO. 1
DANTE VIRGINIA

TEST BORING LOGS

L. ROBERT KIMBALL
CONSULTING ENGINEERS
PENNSYLVANIA

DATE 8-29-77
DATE 8-30-77
SCALE 1" = 10'



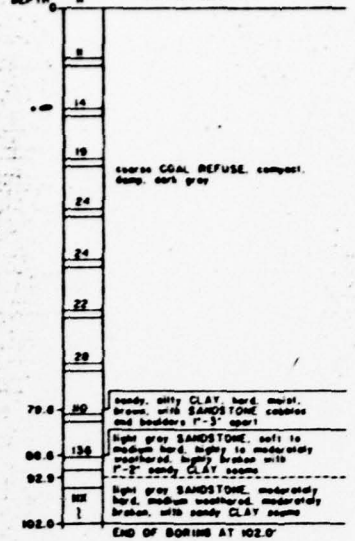


PLATE No. 5

SEE PLAN, SHEET 6 FOR LOCATION OF TEST BORINGS

CLEARFIELD COAL COMPANY
MOSS NO. 1

TEST BORING LOGS

L. ROBERT KIMBALL
CONSULTING ENGINEERS
PITTSBURGH

DRAWN BY	DATE	SHEET NO.
TRACED BY	DATE	
CHECKED BY JAE	DATE 8-29-77	SCALE 1" = 5'
APPROVED BY AJP	DATE 8-30-77	

APPENDIX V

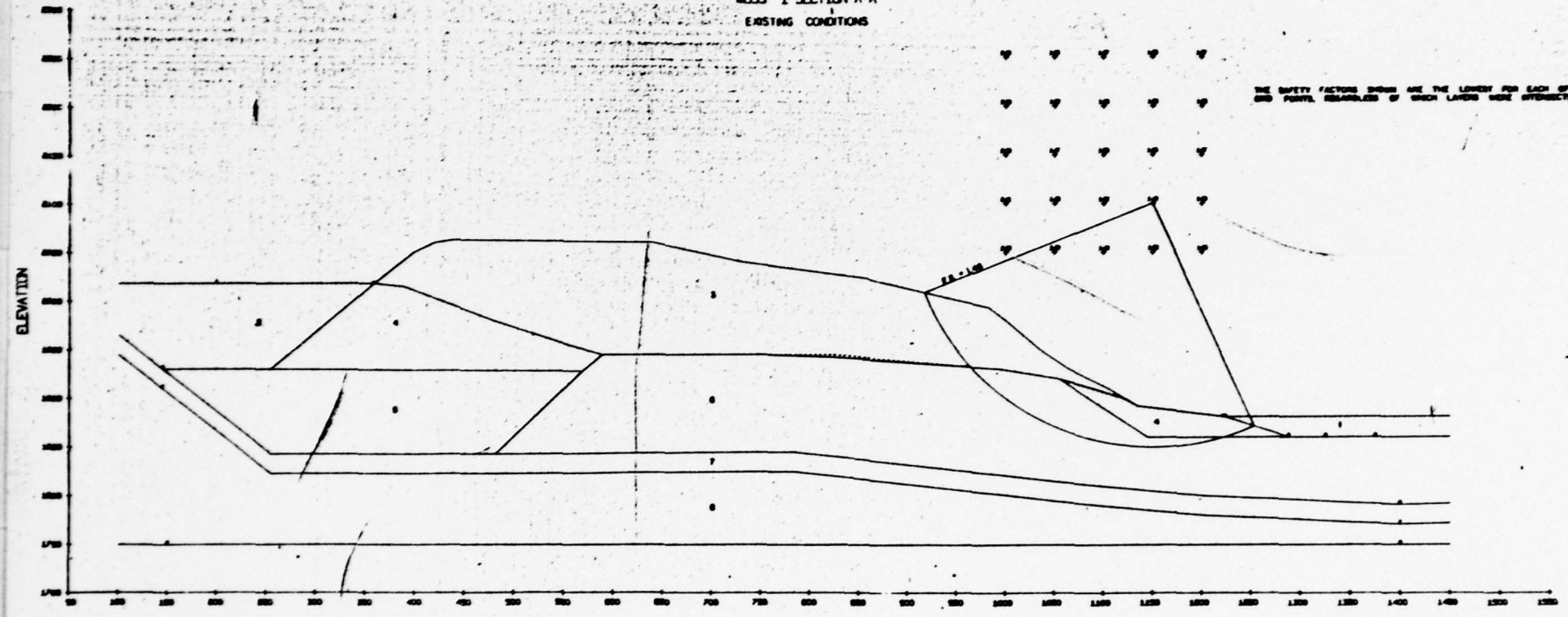
STABILITY ANALYSIS

SUMMARY

SIMPLIFIED BISHOP METHOD

MOSS 1 SECTION A-A

EXISTING CONDITIONS



THE SAFETY FACTORS SHOWN ARE THE LOWEST FOR EACH OF THE GRID POINTS REGARDLESS OF WHICH LAYERS WERE INTERSECTED

SOIL PARAMETERS

LAYER	UNIT WEIGHT	COHESION	ANGLE OF FRICTION	DESCRIPTION
1	0-140	0-600	0-000	WATER
2	0-100	0-288	0-000	SLURRY
3	0-100	0-720	0-115	REFUSE
4	0-100	0-720	0-130	SAT. REFUSE
5	0-100	0-288	0-000	OLD SLURRY
6	0-100	0-432	0-130	SHALE
7	0-100	0-432	0-130	COAL
8	0-100	0-288	0-140	ROCK

PLATE No. 6

SEE PLAN, SHEET 6, FOR LOCATION OF STABILITY SECTION A-A

CLINCHFIELD COAL COMPANY
MOSS NO. 1
DANTE VIRGINIA

STABILITY ANALYSIS

L. ROBERT KIMBALL
CONSULTING ENGINEERS PITTSBURGH

DRAWN BY ... DATE ...
CHECKED BY ... DATE ...
APPROVED BY JAE DATE 8-29-77
APPROVED BY JAP DATE 8-30-77
SCALE 1"=50'
DRAWING NO. ...
SHEET NO. 7 OF 9

APPENDIX VI- REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Department of Army, Office of the Chief of Engineers, 46 pp.
2. Design of Small Dams, U. S. Department of Interior Bureau of Reclamation, 1974, 816 pp.
3. The Geology and Coal Resources of Dickenson County, Virginia, Albert W. Giles, Virginia Division of Mineral Resources Bulletin 21, 1921, 224 pp.
4. Section 4, Hydrology, Part 1, Watershed Planning, SCS National Engineering Handbook, Soil Conservation Service, U. S. Department of Agriculture, 1964.
5. Hydrometerological Report No. 33, U. S. Department of Commerce, Weather Bureau, U. S. Department of Army, Corps of Engineers, Washington, D. C., April 1956
6. Future Coal Refuse Disposal Area for Moss #1, L. Robert Kimbal & Associates, Ebensburg, Pa. 1978